

WHAT IS CLAIMED IS:

1. A method for designing a component of an exhaust system, the method comprising:

designing an original configuration for the exhaust system component; converting the configuration to a three-dimensional mesh; deforming the three-dimensional mesh to define an optimal theoretical shape for the exhaust system component to optimize natural frequencies of the exhaust system component; defining the three-dimensional mesh as a plurality of intersecting flat surfaces; projecting a two-dimensional point cloud onto the optimal theoretical shape; smoothing intersections of the panels between the points of the projected point cloud to define curves with a bend radius substantially equal to the distance between the points of the point cloud for defining an optimal manufacturable shape for the exhaust system component.

2. The method of claim 1, wherein the two-dimensional point cloud defines a two-dimensional rectangular grid.

3. The method of claim 2, wherein the grid of the two-dimensional point cloud comprises a plurality of points, said points being spaced from one another by a distance conforming to a minimum selected bending radius for material from which the exhaust system component is made.

4. The method of claim 2, wherein the grid of the two-dimensional point cloud comprises a rectangular array of points at a spacing of approximately 4.5 mm.

5. The method of claim 1, further comprising the steps of selected at least one panel on the original configuration, and simulating locations for at least a first natural frequency on the selected panel before deforming the three-dimensional mesh to define an optimal theoretical shape for the exhaust system component.

6. The method of claim 5 further comprising the step of simulating locations that will vibrate at least the first natural frequency after deforming the three-dimensional mesh to define an optimal theoretical shape.

7. The method of claim 1, wherein after designing the original configuration, the method further comprises the step of selecting at least one panel of the original configuration and performing subsequent method steps on the panel.

8. A method for manufacturing an exhaust system, the method comprising:

designing an original configuration for the exhaust muffler based on space availability and exhaust flow characteristics;

converting the original configuration digitally to a three -dimensional digital mesh;

simulating locations on the three-dimensional mesh that will vibrate at at least a first natural frequency;

digitally deforming the three-dimensional mesh to define an optimal theoretical shape for the exhaust muffler to optimize the natural frequencies of the exhaust muffler;

defining the optimized three-dimensional mesh as a plurality of intersecting flat surface;

digitally projecting a two-dimensional point cloud onto the intersecting flat surfaces;

smoothing intersections of the panels between the points of the projected point cloud to define curves with a bend radius substantially equal to distances between the points of the point cloud for defining an optimal manufacturable shape for the exhaust muffler;

providing a sheet of metal; and

deforming the sheet of metal to conform to the optimal manufacturable shape.